

## THE ARNOLD ARBORETUM DURING THE FISCAL YEAR ENDED JUNE 30, 1945

THE INSTITUTION was operated during the year within the limits of its income and a modest addition was made to its departmental balance from unexpended unrestricted income. It was expected that a deficit might develop because of a rather radical increase in the labor payroll, as we had to meet the University standards as to daily wages of skilled and unskilled labor, and no budgetary provision had been made to meet this increase. Also, on April 1, 1945, we took title to the Marian Roby Case estate in Weston, mentioned elsewhere in this report, and assumed the rather considerable maintenance costs involved, although the addition to income from Miss Case's generous bequest to endowment funds is not yet available as the estate has not yet been settled.

In addition to income from its restricted endowment, the extra-budgetary Gifts for Cultural Purposes Fund was increased by \$2360.00 in the form of voluntary gifts from forty-eight individuals, while the special Publications Fund was increased by \$10,120.00 from eighty-five contributors, including a very generous grant of \$3000.00 from the Trustees of the Morton Arboretum, Chicago, in appreciation of the cordial relationships that have existed between the two institutions since that institution was organized in 1921. Because of the situation in reference to Professor Rehder's continued work on his Bibliographic Index project, it was felt that the least the Arnold Arboretum could do would be to underwrite the cost of publication of the extensive volume that will result. He has devoted practically full time to the preparation of the manuscript since his retirement from active service in 1940. Therefore, a limited appeal was made for contributions to the Publication Fund, and I am happy to state that this is now sufficiently ample for the purpose. No appeal was made for contributions to the Gifts for Cultural Purposes Fund, as it was not felt that this was justifiable under war conditions. One grant of \$400.00 was received during the year from the Society of Sigma Xi to complete the amount needed for the Raup Alaska Military Highway expedition.

Invested funds remained at approximately the same level as during the preceding year, the regular additions to capital being made to the James Arnold Fund and to the Charles Sprague Sargent Fund in accordance with the terms of the gift. However, under the provisions of two wills now in probate, it is expected that the total endowment of the Arnold Arboretum will be very considerably increased during the coming year, as the two estates are closed.

Under the will of the late Miss Marian Roby Case of Weston, the Arnold Arboretum was indicated as a beneficiary to the extent of \$150,000.00 to capital, and her real estate in Weston consisting of about ninety acres adjoining the estate of her sister, Miss Louisa W. Case, which was presented

to the institution in 1942, with all the buildings, farm equipment, etc. The buildings are insured on the basis of a valuation of \$79,000.00. For tax purposes the land was assessed on the basis of a valuation of about \$37,000.00. In addition, she indicated the Arnold Arboretum to be the recipient of all of her residuary estate after certain specific bequests had been paid. This may prove to be the largest single gift to the institution in the seventy-three years of its existence. The other large bequest is that of Mrs. Katherine T. Balch, wife of the late John Balch of Milton, who made the Arnold Arboretum the beneficiary of one-half of her residuary estate, which may amount to more than \$100,000.00. Both of these bequests were arranged within the past few years.

The conditions of gift are interesting. Mrs. Balch indicated that her gift should be utilized as far as possible for the support of practical horticulture and "for such uses as may reasonably add to the interest and enjoyment of the average visitor and the general beauty of the Arboretum." Miss Case stipulated in her will: "In connection with the gifts herein contained to the President and Fellows of Harvard College for the use of the Arnold Arboretum I impose no restrictions whatever except that the land or its proceeds and the pecuniary bequests shall be used for the general purposes of the Arnold Arboretum. It is, however, my earnest hope that the estate may be maintained and the bequests utilized to further the development of my land and the adjoining land recently presented by my sister, Miss Louisa W. Case, as an adjunct to the Arnold Arboretum in order that the work of that institution may be amplified in a non-urban center, and yet one that is reasonably close to the City of Boston." Our tentative plans for development of the two adjoining estates in Weston appear elsewhere in this report.

**Staff.** — The Arboretum suffered a very severe loss in the death of Mr. Louis V. Schmitt, Superintendent of Buildings and Grounds, on November 16, 1944. Mr. Schmitt had been associated with the institution continuously since 1905, was thoroughly conversant with his duties, very efficient, and always had the best interests of the Arboretum in mind. The place made vacant by his untimely death was filled on January 1, 1945, by the appointment of Mr. Robert G. Williams, a graduate of Cornell University, and former Superintendent of Parks, Greensboro, North Carolina. The technical staff remained as in the previous year, with Dr. Kobuski in active military service, still on leave of absence. Several of the younger men in the grounds department were also absent on military duties. Dr. H. M. Raup was promoted in rank to the position of Associate Professor of Plant Geography. Following the resignation of Mrs. Janet R. Sellars as librarian, Mrs. Lazella Schwarten was appointed to the position. Dr. Lawrence M. Ames, a staff member of the U. S. Department of Agriculture, who for nearly twelve years made his headquarters at the Arboretum, with office and other privileges, finished his work for the Department and left during the year.

**Instruction.**— The graduate student situation was unchanged, very few being in residence at the University. Dr. Johnston and Dr. Raup continued their special courses designed for both graduate and undergraduate students. No radical increase in instruction duties is anticipated until after the close of the war. Professor Bailey has devoted much time, with the assistance and advice of various staff members, to the preparation of a comprehensive report for the administration on botany at Harvard University, both within the Department of Biology and in the nine separately endowed research units, and covering the relationships of the separately endowed units to the University through the Department of Biology. The final report was submitted before the close of the year.

**Buildings, grounds and horticulture.**— No changes have been made in the buildings other than the minor repairs, painting, etc., necessary to maintain them in good condition. Some extra work has been involved with the acquisition of the several buildings on the Case estate in Weston.

As was the case last year, the plantings have suffered from lack of care due largely to the acute labor shortage, supplemented by a combination of circumstances beyond our control. At no time within the history of the Arboretum are signs of neglect more apparent than now. Unless constant attention be given to such items as trimming, pruning, removal of overgrown or malformed shrubs, trees, and vines and their replacement by others, weeding, spraying, fertilizing, grass cutting, and other standard maintenance practices, plantings quickly get out of hand. Until more labor is available, we cannot cope with this situation. It is a concomitant of the unsettled conditions brought about by the war and we will have to bear with it until after the close of hostilities.

Abnormal seasonal conditions and other circumstances added to our difficulties. There was little winter injury due to low temperatures, and there were but few, and not at all destructive, grass fires in the fall and spring because of the abundance of rainfall. A very heavy fall of wet snow on February 8 caused an extraordinary amount of limb breakage, it taking the entire grounds crew three weeks to take care of only the most obvious places by the necessary and often heavy pruning. Many of the shrubs were crushed to the ground and some of them will need very heavy pruning before they again become attractive in form. This delayed the normal spring rehabilitation campaign, but here again the season was against us, for the period of bloom commenced a full month ahead of the normal time. Following this unseasonably warm weather, there was a protracted wet season lasting into the summer months, thus favoring a most unusually lush growth of grass and coarse weeds. Without our knowledge, a large addition had been planned to the State Serum Laboratory building in the Bussey Institution grounds. The architect's plan had been finished and the contract let before we were informed. It so happened that the area selected for the building was fully occupied by our extensive nursery. Thus, on very short notice, we had to prepare a new nursery site and

transfer all of the valuable stock from the old nursery. Because of the abnormally advanced season, we had but about a week in which to make this radical change. A week or two later it would have been impossible to move the stock with safety, as the spring growth had commenced or was about to commence. It was most fortunate that we learned of this projected building plan in time, otherwise our losses in valuable selected stock would have been very great. As it was, it put an additional strain on our relatively small grounds crew at a most critical time and further prevented them from giving proper attention to other maintenance matters.

Thus, largely because of war conditions, it has become increasingly difficult to maintain the living collections in an attractive condition. No new plants were added to the permanent living collections during the fall and spring planting seasons, and it is clear that plantings of new material should be kept at a minimum until the time arrives when we can properly care for what we have in place. Because of the limited amount of labor available, it has been necessary to concentrate the work on special projects and let the other areas remain with a minimum of care.

Special attention was given in the fall to the extensive shrub collection near the Forest Hills gate, as it had become badly overgrown. Each alternating grass walk was removed, and the soil was limed and heavily fertilized. All the shrubs were heavily pruned and the labels were replaced by new ones, these being set back from the walks so as to permit of machine cultivation. It is evident that this thorough renovation was justified, for the annual cost of maintaining this large collection was reduced by about one-half, due to the saving of hand labor. It is planned to continue this concentration of work for several years or until all of the large special collections have been renovated. The next one in line is the very large lilac collection, some clumps of which have become badly overgrown, while others have developed altogether too many sucker shoots.

A new nursery was established on prepared land between South Street and the railroad track, but this is only a temporary expedient. The nursery on the Case estate in Weston was enlarged, and some of our valuable stock in the old nursery, that had to be abandoned because of the projected building mentioned above, was transferred there.

In spite of war conditions, 447 living plants were received and established in our nurseries. At the same time, we received also nine lots of scions and eighty-nine lots of seeds. During the year 496 living plants were distributed, as well as 48 lots of scions and 22 packages of seeds; 175 trees and shrubs were presented to the Harvard Business School to be utilized in a planned improvement of its grounds.

In order to keep maintenance charges at a minimum on the Case estate until such time as income may be received from the Marian Roby Case bequest, certain changes are being made on the Weston property, chiefly in the elimination of certain types of plantings that scarcely fall within the field of the Arboretum. Thus one planting of about 700 named varieties of *Iris* has been eliminated, but the plants were not destroyed. A complete

collection of these was sent, through Garden Clubs Services, Inc., to the Essex Sanatorium in Danvers for use in beautifying the grounds and to assist in the retraining of disabled veterans, chiefly psychiatric cases. A selected lot of about 100 of the better varieties was sent to the Rutland Training Center of the Central New England Sanatorium for the same purposes. About 500 varieties were presented to the Boston Park Department.

Further mechanical equipment has been acquired, including a new Fordson tractor with attachments for plowing, cultivating, and hay cutting, with view to further reducing the amount of hand labor needed to maintain the attractiveness of the grounds. We should now be able to take care of these items with our own force and equipment; formerly, for certain types of work, we had to arrange contracts with outside individuals or firms.

**The Case Estates in Weston.**—As previously reported, the estate of Miss Louisa W. Case in Weston, consisting of about 60 acres of land, a large residence, barns, and a very excellent and commodious greenhouse, was presented by her to the Arnold Arboretum in December, 1942. Miss Marian Roby Case of Weston, sister of Miss Louisa W. Case, redrew her will in 1943 in favor of the Arnold Arboretum as mentioned in the opening part of this report. This estate comprises about 90 acres of land and eight buildings of one type or another. Our very keen desire is to develop these two adjoining estates as an adjunct to the Arnold Arboretum and to concentrate there most of our experimental work, including some of that of the Bussey Institution and of the Cabot Foundation for Botanical Research, and a part of Dr. Mangelsdorf's corn breeding project, as excellent farm land is now fortunately available. It is expected that much of our propagating work will also be done at the Weston site and the material moved in to the Arboretum proper as needed.

An excellent opportunity is thus afforded for a general expansion of our experimental work, and at the same time a judicious planting of ornamental and useful trees and shrubs in Weston to augment those of the Arnold Arboretum. For many years it has been evident that the present Arboretum site is not suitable for certain types of work. It can and must be maintained as an attractive park, but with the very limited amount of really good land available, the present crowded condition of its plantings, the pressure of the population (for the Arboretum site adjoins a densely populated part of Boston), and a certain amount of vandalism that it is practically impossible to control properly, we are badly handicapped. With this opportunity now open in the strictly residential town of Weston, only twelve miles from the Arboretum in Jamaica Plain, we have the opportunity of greatly amplifying our experimental and propagating work, and of initiating lines of research that it has hitherto been impossible to develop on the original site. Again, in Weston we will not be subject to the population pressure, vandalism will be at a minimum, and the plantings will not be damaged by the smoke and dust of the city.

In anticipation of a definite plan of improvements for the Weston properties, about ten acres of the best farm land were plowed, fertilized, and cover-cropped in the spring in order to get the land into first-class condition for future operations. Seed beds have been prepared, hot beds installed, and nursery space expanded. Some general clearing has been prosecuted, certain decrepit trees and shrubs removed, and a definite policy of reducing actual agricultural operations in favor of experimental work and arboretum development actually initiated. Thus it seems to be clear that in future years the Weston property can be developed into a highly useful adjunct to the Arnold Arboretum, to serve not only the purposes of this unit, but also those of several of the other separately endowed botanical units as well as the Department of Biology of Harvard University, where certain types of research demand proper space and a reasonable amount of land. There we can closely control the situation without undue interference by certain elements of the general public; in its present site the Arboretum proper can never expect to maintain the strict control that is demanded in connection with experimental plantings.

**The War Effort.**—We have continued to coöperate with different government agencies in work on various botanical problems with which representatives of the armed services became involved, particularly in reference to the Southwest Pacific area, Micronesia, the Philippines, and in preparation for projected operations in China, Formosa, and other oriental countries. *Native Woods for Construction Purposes in the Western Pacific Region*, compiled by Dr. J. H. Kraemer, was issued by the Bureau of Yards and Docks, Department of the Navy, May, 1944, and a greatly amplified edition appeared in September, 1944, both restricted. The illustrations were prepared at the Arnold Arboretum and the basic lists were prepared here. A third volume, *Native Woods for Construction Purposes in the South China Sea Region*, unrestricted, appeared in January, 1945, in the preparation of which we also coöperated, although some of its illustrations were prepared at the Smithsonian Institution, in part based on material that we loaned for the purpose.

Dr. I. M. Johnston made two special trips to the tropical base of the Chemical Warfare Service in connection with certain problems with which that organization was concerned in connection with its tropical operations. This field work cannot at the present time be discussed further because of its confidential nature, but the large collections assembled by him will be the basis of a future technical paper when restrictions shall have been modified.

We have continued to receive and to report on botanical collections made by service men stationed here and there in the Old World tropics, shipments coming in all the way from Upper Burma to New Caledonia. It has so far been possible to report upon each lot within a day or two after the packages were received. Most of this work has fallen to the undersigned, who has also continued to lecture every two months to each

group of trainees in the intensive course on tropical medicine at the Army Medical School in Washington. Work on the manuscript of *Plant Life of the Pacific World* was completed and the proofs were finished before the close of the year. The sales edition of this work is published by the Macmillan Company, but simultaneously a special unabridged Fighting Forces edition, pp. 298, 256 fig., was issued by the Infantry Journal, Washington, D. C., in its series of standard military books. This book is one of a series on various phases of natural history of the Pacific region, including individual volumes on the animals, native peoples, fishes and shells, reptiles, insects, birds, etc., following the publication of *The Pacific World*, edited by Fairfield Osborn, President of the New York Zoological Society, under the auspices of the American Committee for International Wild Life Protection. Each volume was oriented toward the needs of our service men stationed here and there in the Pacific region.

**Botanical Survey of the Alaska Military Highway.**—A second season's work was projected during the preceding year and the plans were outlined in the report for 1943-44. The personnel of the party and the sources and amounts of funds (\$5300.00) provided to take care of field expenses were also indicated. The party of seven left for the field at the end of May and returned about the middle of September. The military authorities extended the same privileges as those provided during the summer of 1943, that is, free transportation on the road and commissary privileges. The results obtained in botany, ecology, geology, and archeology are significant. Work was concentrated on the upper part of the road from Fairbanks to Whitehorse, as the 1943 operations covered the southern part of the road from Dawson Creek to Whitehorse, but at the end of the season, the party came out via Dawson Creek, thus covering the entire length of the road, some 1500 miles. Approximately 13,000 botanical specimens were prepared, and this large collection, combined with the even larger one (15,000 specimens) made in 1943, will be studied as a whole and thus form the basis of a comprehensive report on the vegetation of the previously little known region traversed by the road.

**Plant Breeding.**—The more promising new hybrid trees and shrubs are being propagated for further testing and for distribution. Among the more recent productions are species hybrids of maples, honeysuckles, forsythias, lilacs, roses, apples, and cherries. Triploid forsythias have been produced by crossing the artificially induced tetraploids with diploids. Experimental work on polyploidy has been continued.

The more important genera of the Pomoideae are being used in an attempt to obtain rootstocks which will produce dwarf trees or otherwise modify the normal growth habit of the grafted stock. The grafting compatibility of generic combinations in this subfamily of the Rosaceae has long been known but no systematic study has been made. *Crataegus*, *Chaenomeles*, *Cydonia*, *Aronia*, and *Sorbus* are being grown on *Malus* rootstocks and

many more combinations are being made. Many of these will grow, as grafts, only for a year or two, but some of the progeny may prove to be of horticultural value. The large temporary orchard of hybrid crab apples established a few years ago on the Walter Street tract has served its purpose. The promising new hybrids have been segregated and the worthless stock removed.

**Wood Anatomy.**—Professor Bailey and Dr. Nast have continued their morphological investigations of the ranalian families in collaboration with Dr. Smith. Detailed anatomical and histological studies have been made of the stem, roots, leaves, floral organs, pollen, and seeds of the taxonomically puzzling genera *Tetracentron*, *Trochodendron*, and *Euptelea*. Although superficially dissimilar, *Tetracentron* and *Trochodendron* exhibit fundamentally significant similarities in their vesselless xylem, in their peculiar stomata, ovules, seeds, pollen, and internal floral structure. The genera should be placed in two separate, but closely related, families. *Euptelea* differs from these genera in the morphology of all of its organs and should be maintained as an independent family. There are no evidences of close genetic relationships between the Tetracentraceae, Trochodendraceae, or Eupteleaceae and such families as the Magnoliaceae, Winteraceae, or Schisandraceae.

**The Herbarium.**—During the year 14,281 specimens were mounted, of which 12,193 were inserted into the herbarium, which now contains a total of 630,137 specimens.

In continuation of the arrangement with the Gray Herbarium mentioned in the last report — the mounting of some of the accumulated Old World collections belonging to that institution — 2276 specimens were returned mounted. The mounting of specimens at the Arboretum continues at the rate of incoming material, a rate below normal due to war conditions. However, this has its compensation in that the mounting staff is able to devote considerable time to repairs of material already incorporated, many of the early collections having been placed in the herbarium inadequately strapped.

Incoming specimens numbered about 27,945. The bulk of this material was obtained by subsidy, purchase, or by collections of staff-members, but some of it came through exchanges (3,545), gifts (1,154), or for identification by our staff (2,190). Especially noteworthy collections were about 13,000 specimens obtained by Dr. Raup during his second season along the Alaska Military Highway, about 3,500 specimens gathered by Dr. Johnston on San José Island, Panama, and 2,491 specimens sent by Dr. J. Cuatrecasas from Colombia as the result of a trip partly financed by the Arboretum. Geographically, acquisitions may be broken down as follows: America north of Mexico, 13,684; Central America and Mexico, 4,273; West Indies, 918; South America, 3,532; Pacific Islands and Australasia, 1,742; Asia and Africa, 1,345; miscellaneous (mostly cultivated or North American), 2,451.



A total of 17,274 specimens was distributed to other American institutions, the bulk of this material going to other departments of Harvard University as inter-institutional transfers. To the Gray Herbarium were transferred 14,083 specimens, of which 9,648 were mounted; this last figure includes 7,835 Argentine specimens originally received from the Instituto Miguel Lillo, Tucumán, and mounted at the Arboretum over a period of two or three years. Thirty-five specimens were transferred to the Farlow Herbarium and a similar number to the Ames Orchid Herbarium at the Botanical Museum. To other American institutions the Arboretum sent 2,982 specimens in exchange, 101 specimens as gifts, and 38 specimens for identification. A total of 1,281 mounted illustrations of herbaceous plants and ferns was transferred to the Gray Herbarium for incorporation into the collections. Microfilm and publications to the equivalent value of 1,601 specimens were distributed. To summarize, the total number of specimens or their equivalent in illustrations, microfilm, or publications distributed by the Arboretum was 20,156.

Staff-members and students of ten American institutions requested and were granted 20 loans from the Arboretum, totaling 3,207 specimens and 97 clippings and illustrations. For study by members of our own staff, 33 loans consisting of 2,284 specimens were borrowed from eleven institutions.

A total of 1,652 cards was added to the catalogue of references to new species and other important literature dealing with woody plants, this catalogue now containing 138,650 cards. For the second successive year no additions were made to the collection of negatives representing types and critical specimens; this is partly due to the lack of adequate photographic equipment and partly to the fact that specimens which might normally be photographed are not now available on loan.

Crowding of specimens in the herbarium grows more critical each year, as no additional floor space or cases are available; as usual, only the most important material has been filed in the herbarium, the remainder being stored in a more or less inaccessible place. The usual number of clippings, typed descriptions, and illustrations was inserted into the herbarium.

Special studies were pursued by members of the herbarium staff, and the usual routine identifications were made. Professor Rehder continued to work on his *Bibliography of Cultivated Trees and Shrubs*, prepared several papers on detailed problems of nomenclature, and devoted considerable time to the assistance of other staff members and visitors who continue to seek his advice. Dr. Smith, in collaboration with Professor Bailey and Dr. Nast, completed work on certain small families of the Ranales and began a study of the Schisandraceae and its immediate allies; he also studied special groups of tropical collections. Dr. Johnston devoted most of his time to botanical work for the Chemical Warfare Service, making two extended trips to the tropical research center maintained by that organization. Data for publication will not be available until after the close of the present war. Dr. Raup has continued work on his assembled data on the vegetation of the Athabaska–Great Slave Lake region and on

the Mackenzie Mountains, and excellent progress has been made in preparing the material for publication. Work on both of these projects was interrupted because of his absence during the summers of 1943 and 1944 in prosecuting a botanical survey of the Alaska Military Highway, mentioned elsewhere in this report. He has organized his very extensive botanical collections made during the two summers mentioned, some 28,000 specimens, in preparation for an intensive study of them. He has also, in association with the archeologist Mr. Frederick Johnson of Andover, re-initiated his study of the peat deposits in the Taunton River estuary, an interesting archeological site which is now covered by several feet of salt-marsh peat and is well below high tide. The joint report on this investigation has been completed and it will be published shortly. Dr. Kobuski, after nearly three years of military service, was granted an honorable discharge in June and will rejoin the Arboretum staff in the near future. Mr. Palmer continued his study of the genus *Crataegus* and also investigated the taxonomy of certain hybrid oaks. Dr. Allen completed her study of the Lauraceae of Central America and Mexico and prepared a revision of the group for this area. Dr. Perry's translation of Professor H. J. Lam's "Fragmenta Papuana" from the Dutch was completed and the English work was published as No. 5 of *Sargentia*; in addition she continued her study of the New Guinea material of the Richard Archbold Expeditions, mostly in the large family Rubiaceae. Dr. Croizat pursued his studies of the Euphorbiaceae, with special attention to groups from South America and the southwestern United States. I have continued certain types of bibliographic work, mentioned under bibliography in this report, continued to report on packages of botanical material sent in by service men from Upper Burma, Assam, the Philippines, Micronesia, New Guinea, Solomon Islands, and New Caledonia, and completed the proof reading of *Plant Life of the Pacific World*.

**Bibliography.** — Dr. Frans Verdoorn edited volumes one and two of the new *Annales Cryptogamici et Phytopathologici*, which is a continuation of the earlier *Annales Bryologici*; also edited by him are volume eight of the *Chronica Botanica* and volumes fifteen and sixteen of *A NEW SERIES OF PLANT SCIENCE BOOKS*. The last volume, *Plants and Plant Science in Latin America*, is an extensive work prepared with the coöperation of nearly one hundred collaborators. It includes a revised edition of his list of Latin American plant science institutions and societies, which is used as a basic list by many agencies of the United States and foreign governments. He also continued to act as botanical adviser to the Board for the Netherlands Indies, Surinam and Curaçao, and to guide the activities of the Central Depository Library for the Netherlands Indies in New York City. During the year about 15,000 sheets were added to the master file of his major project, the *Index Botanicorum*, and a booklet describing the aims and scope of this project was issued in the fall of 1944 which resulted in his securing the services of many new collaborators.

Professor Alfred Rehder, retired, continued to work daily on his comprehensive Bibliographic Index, and it is expected that the very extensive manuscript will be completed and ready for publication before the middle of the coming year; well in excess of 2,000 pages of typescript is finished. Fortunately, funds are now available to cover the cost of publication of what will prove to be a very useful reference work. My own work has been largely bibliographical, in an attempt to complete the manuscript, now some 1,400 typed pages, of a comprehensive Index Rafinesquianus, and with corresponding problems in connection with the published works of William Bartram, H. L. Muhlenberg, and Amos Eaton. The total number of validly published generic and specific names in all of Rafinesque's known published works that remain unlisted in our standard indices will approximate 3,400. Work on this project led me to an examination of the published works of the other three early American botanists, and in their works it is now evident that there are also many unlisted technical names. A paper on the botanical names published by William Bartram was finished and is now in press, while work on the Muhlenberg and Eaton problems is well advanced.

**The Library.** — The library holdings were increased by 271 bound volumes and 144 pamphlets, making the totals in each group 45,834 and 13,606. Seven hundred and eleven typewritten cards were added to the main catalogue, 3664 printed cards to the Gray Herbarium index, while 817 slips supplementing the author and subject catalogue were added to the file. The very extensive series of photographs was increased by 200 items, while many orders were received for prints from our negatives. Inter-library loans have been extensive, a total of 510 volumes being loaned to or borrowed from 34 libraries in all parts of the country. This inter-library loan service is of great value to staff members of both this and other institutions, as well as to students, and the privilege is not abused. There have been no losses, although various rare items have of necessity been involved. The most outstanding gift was a magnificently bound eight-volume set of Sander's *Reichenbachia* from Mrs. Theodore Brown of Milton, and the rare three-volume elephant folio edition of the Audubon-Bachman Viviparous Quadrupeds of North America, from the late Miss Marian Roby Case of Weston.

**Atkins Institution of the Arnold Arboretum.** — The limitations mentioned in the report for the previous year prevailed, the plantings unfortunately being now in a somewhat deplorable condition. The chief factor here was the increased cost of labor, combined with the fact that the general plantings had been extended to such an extent that it was impossible to give them all proper care within the limits of the income available. No students were in residence because of war conditions, but a number of individuals interested in research and in economic problems visited the institution to secure information of one type or another.

About thirty new seed beds with cement borders were constructed to keep the soil from being washed down by heavy rains. Some of these were planned for vegetable growing, others for the development of seedlings of timber trees. In June there was delivered to the Soledad Company somewhat over 1,000 young teak trees to be used in the extension of its timber plantings. Seedlings of other important timber trees are available for future plantings.

In spite of an abnormally dry year, the rainfall being 42.69 inches, about ten inches below normal, a number of the larger specimens were moved from the nursery to their permanent places in the grounds, and this will be continued until the available material is taken care of. Opportunity was taken, because of the unusual dry period in May and June, when all of the ponds were empty, to check the dams and to make the necessary repairs.

During the year, 162 packages of seeds and 50 living plants were received from abroad, and seeds from 123 different species were collected in the garden to be used there. Distributions included 230 packages of seeds and 652 living plants. Of the latter, over 300 were sent to the Marine Corps base at Guantanamo to be used in landscaping the grounds, and 136 were presented to the Cuban Ministry of Agriculture.

The entire problem of the future development and utilization of the facilities available at Soledad for instruction, research, practical horticulture, and forestry has received considerable attention, one special short report having been prepared expressing my personal ideas on the subject, and the matter is further considered in the area survey report prepared for the administration by Professor I. W. Bailey.

The resignation of Mr. David Sturrock as Superintendent was accepted, effective at the end of June, 1945, and Mr. Frank G. Walsingham was promoted to fill the vacancy.

**Publications.** — The usual four numbers of the Journal included 35 technical papers, mostly by members of the Arboretum staff, and a fifth number of *Sargentia*, containing Dr. Perry's translation from the Dutch of Professor Lam's "Fragmenta Papuana," with two maps and 32 text-figures taken from the original, was published. The usual numbers of *Arnoldia* were issued. Several of the papers included in *Arnoldia* have been highly commended for their practicability, including one number on rapidly growing vines available in the United States, an outgrowth of certain phases of our earlier camouflage investigations, one on the Park Arboretum (how to establish a living war memorial) which has been widely reproduced, and one on the building up of bird populations through selecting food plants. The Massachusetts Audubon Society had 10,000 reprints of this prepared for its own use. As usual, a certain number of technical and popular papers were prepared by staff members and published in various periodicals. A bibliography of the papers published by staff members and students follows.